

REMARKS/ARGUMENTS

Examination and reconsideration of all claims currently remaining of record is respectfully requested. Claims 135-153, 186-201 and 204-205 are currently pending. By this amendment, independent claims 135, 186, 187 and 204 are amended above so as to give greater emphasis to some of the novel and patentable features set forth by these claims. The amendments are fully supported by the original disclosure and, thus, no new matter has been added. If the Examiner should disagree, however, it is respectfully requested that the challenged limitation be pointed out with particularity in the next Action so support may be cited in response.

Re the 35 U. S. C. § 112, First Paragraph Rejection:

Claims 135-140, 142-153, 186-191, 195-201, 204 and 205 were rejected under 35 U.S.C. §112, 1st paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the invention was filed, had possession of the claimed invention. In particular, it is stated in the Office Action that the specification does not provide support for “said special purpose hardware graphics processor unit performs a 3x3 matrix transformation of x, y and z graphics data points to provide rotated and/or scaled polygon-based 3D objects at high speed”, as recited in independent claims 135, 186, 187 and 204. (The dependent claims listed above being rejected for the same reason.) The Applicants respectfully traverse for at least the following reasons:

Applicants’ specification explicitly provides an example program listing (“Listing Rotate”) that illustrates how the special purpose hardware graphics processor (“Mario chip”)

may be programmed to perform a rotation of x, y and z data points using a 3x3 rotation matrix, beginning at page 131. (See also Applicants' U.S. patent 5,388,841 at col. 54, lines 47 through col.56, line 12.) In particular, Applicants' example "Listing Rotate" program includes comments at the top of the program which explicitly state "Rotate an array of 8 bit x,y,z points by a rotation matrix in the registers rmat1211, rmat2113, rmat2322, rmat3231, rmat0033" and "matrix elements are 8 bit signed fractions ... these are stored compactly as 2 8 bit elements per register". (See, e.g., Applicants' '841 patent at col. 54, lines 57-65 and col. 55, lines 1-8.)¹

Applicants' specification also clearly discloses that "[T]he graphics coprocessor of the present invention may be used to generate 3D type (and other) special effects including those involving rotated and scaled polygon-based objects at high speed, while only minimally burdening the host video game processing system." (See Applicants' specification at page 135 or Applicants' '841 patent at col. 56, lines 7-12.)

Re the non-statutory Obviousness-type Double Patenting Rejection:

Claims 135-140, 142-153, 186-191, 195-201, 204 and 205 were rejected under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 1-57 of San et al. (U.S. Patent 5,388,841) in view of Logg (U.S. patent 5,415,549). Applicants respectfully traverse this rejection for at least the following reasons:

Applicants' claims 135-140, 142-153, 186-191, 195-201, 204 and 205 as presently amended are directed toward a "home video game system for use with a *television type monitor display*". In contrast, the Logg and Loffredo references are primarily directed toward high-end

¹ In Applicants' disclosed example, the transformation matrix values are stored in five of the special purpose hardware graphics processor's registers, wherein each register contains two 8-bit signed fractions per register. This matrix may also be used to perform scaling operations when set up with appropriate values.

flight simulators and sophisticated video arcade-type video game systems, and do not teach or suggest a simple inexpensive 3D graphics rendering arrangement suitable for use in an inexpensive *home video game system* as provided by Applicants' invention. In addition, Applicants' independent claims, as presently amended, specifically require a home video game system which comprises a "game program processor" for executing a videographics program and a single "special purpose hardware graphics processor" that acts as a coprocessor in conjunction with the game program processor to perform separately and independently from the game processor the tasks of *high speed 3D spatial coordinate transformation computations utilizing a 3x3 transformation matrix for computing new x, y and z spatial coordinates of polygon graphics data points to enable displaying of rotated and/or scaled polygon-based 3D objects at high speed and writing of polygon pixel data to the video RAM.*

These claimed features are not recited in any of the claims of the San et al. '841 patent, nor are these features obvious from the context of the '841 patent claims considered either alone or in view of the Logg '549 patent. Moreover, in respectful traverse of the Examiner's contentions, column 10, lines 45-62 of the Logg '549 patent do not teach or suggest performing *matrix* transformation of graphics data points to provide rotated and/or scaled polygon-based 3D objects. Instead, at column 10, lines 45-62, the Logg '549 patent discloses that, in addition to the TI 34010 Graphic System Processor (GSP) chip, a separate ADSP-2100 signal processor is included in Video Process hardware 160 to provide the "higher-level" functions of video display such as translation, rotation and scaling, while the GSP performs the low-level graphics work of writing polygons to a video display. Nowhere in the patent does Logg either disclose or suggest the use of a 3x3 transformation matrix to affect rotated and scaled polygon-based 3D objects. Accordingly, it is respectfully contend that Applicants' claims 135-153, 186-201 and 204-205, as

presently amended, are unobvious and patentably distinct over the claims of Applicants' '841 patent at least because of the claimed recitation of a special purpose hardware graphics processor that utilizes a 3x3 transformation matrix for computing new x, y and z spatial coordinates of polygon graphics data points to enable displaying of rotated and/or scaled polygon-based 3D objects.

Re the 35 U. S. C. § 103(a) Rejections:

Claims 135 and 136 stand rejected under 35 U.S.C. § 103 as allegedly being unpatentable over U.S. Patent 5,016,876 to Loffredo in view of U.S. Patent 5,415,549 to Logg. This rejection is traversed for at least the following reasons:

Applicants' independent claim 135 as amended requires a programmable special purpose hardware graphics processor unit that performs high speed 3D spatial coordinate transformation computations utilizing a 3x3 transformation matrix for computing new x, y and z spatial coordinates of polygon graphics data points to rotate and scale polygon-based 3D objects.

Neither Loffredo nor Logg, considered either alone or together, disclose or suggest a home video game system that uses only a single programmable special purpose hardware graphics processor in addition to the host game program processor within the same home video game system, wherein the special purpose hardware graphics processor performs both high speed 3D spatial coordinate transformation computations by utilizing a 3x3 transformation matrix for computing new x, y and z spatial coordinates of polygon graphics data points to enable displaying rotated and/or scaled polygon-based 3D objects and also performs writing of polygon pixel data to the video RAM, as set forth in Applicants' independent claims.

Applicants' rejected dependent claim 136 incorporates the features of amended independent claim 135 from which it depends and is likewise patentably distinct over the cited prior art for at least the same reason.

The Loffredo '876 patent does not teach or suggest performing the constructing or rendering of virtual 3D graphic objects or using a 3x3 transformation matrix for performing high speed spatial coordinate transformations on x, y and z polygon graphics data points for rotating or scaling 3D graphic objects. In fact, Loffredo effectively teaches away from constructing and displaying polygon-based 3D graphic objects because it is directed toward providing a DMA coprocessor for use in a video game machine that displays composite scenes by superimposing many overlapping planes of image data (i.e., separate images lying in a plurality of distinct image planes), each plane of image data inherently comprising only 2D graphic image data.

Likewise, as mentioned above, the Logg '549 patent fails to teach or suggest performing a *matrix* transformation operation on polygon-based graphics object data points to provide rotated and/or scaled polygon-based 3D objects. In particular, the Logg '549 patent fails to teach or suggest using a 3x3 transformation matrix for performing high speed spatial coordinate transformations on x, y and z polygon graphics data points for rotating or scaling 3D graphic objects for and displaying 3D graphic effects at high speed, as set forth in applicant's claims as amended. In addition, the Logg '549 patent fails to teach or suggest using only a single coprocessor in addition to the game program processor for performing such rotation and scaling operations. Instead, the Logg '549 patent teaches away from Applicants' claimed arrangement by teaching that, in addition to requiring the use of a TI 34010 Graphic System Processor (GSP) chip together with a TI 68000 general purpose program processor, an additional separate ADSP-2100 signal processor is also required in the Video Process hardware 160 to "provide the

“higher-level” functions of video display such as translation, rotation and scaling, while the GSP performs the low-level graphics work of writing polygons to a video display.”

Moreover, even assuming for the sake of argument that the features of Logg were properly applicable to Loffredo, Logg does not remedy the deficiencies of Loffredo with respect to the claimed use of a 3x3 transformation matrix for performing spatial coordinate transformation operations on x, y and z graphics data points for rotating or scaling 3D graphic objects. Nowhere in the ‘549 patent does Logg either disclose or suggest the use of a 3x3 transformation matrix to affect rotated and scaled polygon-based 3D objects. As such, the proposed combination would not have resulted in the subject matter of Applicant's claims 136 and 136.

In further distinction over the prior art of record, Applicants’ claimed special purpose hardware graphics processor performs *both* the “higher-level” functions of video display such as rotation and scaling *and* the task of writing polygons to a video display RAM.

Claims 135-140, 142-153, 186-191, 195-201 and 204-205 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Loffredo and Logg and further in view of the PC TECH Journal publication, “Custom-Tailored Graphics: TMS 34010”, by McNierney. This rejection is traversed. Applicants’ independent claims 186, 187 and 204, as amended, require a programmable special purpose hardware graphics processor unit that performs high speed 3D spatial coordinate transformation computations utilizing a 3x3 transformation matrix for computing new x, y and z spatial coordinates of polygon graphics data points to enable displaying of rotated and/or scaled polygon-based 3D objects at high speed and performs writing of polygon pixel data to the video RAM. The PC TECH JOURNAL by McNierney, considered

either alone or together with Loffredo and Logg, fails to teach or suggest a special purpose hardware graphics processor utilizing a 3x3 transformation matrix for computing x, y and z spatial coordinates of polygon graphics data points to provide rotation and scaling of one or more polygon-based objects for constructing and displaying 3D graphic objects at high speed, as required by applicants' claims. Consequently, for at least the same reasons as set forth above with respect to Logg and Loffredo, the proposed combination would not have resulted in the subject matter of applicant's independent claims 186, 187 and 204. Applicant's remaining dependent claims incorporate the features of the amended independent claims from which they depends and are likewise patentably distinct over the cited prior art for at least the same reasons.

In view of Applicant's foregoing remarks and current amendments to the claims, it is believed that the application is in condition for allowance. Favorable consideration and allowance of this application are respectfully solicited. If any small matter remains outstanding, the Examiner is encouraged to telephone Applicants' representative at the telephone number listed below or on the following page.

Respectfully submitted,

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